COVID-19 infection characteristics and outcomes in a predominantly Latino community hospital

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Abstract

Introduction **The coronavirus disease 2019 (COVID-19) pandemic has rapidly spread worldwide and claimed millions of lives. Several studies have attempted to understand the relationship between COVID-19 infection and health disparities. The aim of the current work was to evaluate the pre-admission health characteristics, symptomatology, diagnostic abnormalities, treatment measures and clinical outcomes of the community served by our institution, with a sub-analysis of our Hispanic community.**

Methods **This is a single-center, cross-sectional cohort study of patients with COVID-19 admitted from 15 March 2020 to 30 April 2020 to MacNeal Hospital. A retrospective chart review was performed including patients >18 years and a positive nasopharyngeal SARS-CoV-2 PCR. Demographical data, comorbidities, clinical data, treatment regimen, and patient outcomes were collected.**

Results **A total of 257 patients were included in the study of which 60.4% were identified as Hispanic. The median age at admission of Hispanic patients was significantly lower compared to non-Hispanic patients (56.6 vs. 65.7 years, p<0.01). Non-Hispanic patients had lower prevalence of hypertension, coronary artery disease, and chronic lung disease. Most common at presentation were shortness of breath (69.6%), cough (69.2%), and fever (64%). Hypertension was the most common comorbidity (53.6%). Approximately 89% of the patients received antibiotics, 40.4% hydroxychloroquine, 13.2% steroids, and 6% tocilizumab. Twenty six percent required mechanical ventilation (MV), and over half of them (56.7%) were Hispanic. The strongest factors associated with MV were smoking (OR 2.97, 95%CI 1.01-8.69), CRP >10 mg/dL (OR 4.53, 95%CI 1.49-13.38) and D-dimer >1.5 mcg/mL (OR 3.63, 95%CI 1.31-10.05). An oxygen saturation of >90% on room air on presentation was a protective factor when predicting intubation (OR 0.11, 95%CI 0.03-0.33). The overall 30-day mortality rate was 17.1% (n=44); 11.9% in the Hispanic group vs 26.3% in the non-Hispanic group (p<0.003).**

Conclusions **Our review of consecutive patients admitted with COVID-19 demonstrated that over half of patients were of Hispanic descent. Interestingly enough, despite being significantly younger and healthier, the need for mechanical ventilation in the Hispanic group was not significantly different compared to the non-Hispanic group. However, the Hispanic group had a lower mortality rate.**

Keywords **COVID-19, SARS-CoV-2, Hispanic/Latinx.**

Introduction

Since the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in Wuhan, China in December 2019 there has been a rapid spread of the disease worldwide. This led to the current coronavirus disease 2019 (COVID-19) pandemic, confirmed by the World Health Organization (WHO).[1-3] With the rapid spread and evolution of COVID-19, many different studies have reported a myriad of different clinical findings as well as potential therapeutic options.

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Studies have attempted to understand the relationship between COVID-19 and health disparities. In cities like New York, the most affected neighborhoods were composed of predominantly Black/African American and Hispanic/Latinx populations.[4]

Given the growing attention regarding the impact of COVID-19 on vulnerable communities, the present study was conducted in a community hospital in the Chicagoland area that provides healthcare to a predominantly medically underserved Hispanic/Latinx community. The aim was to evaluate the pre-admission health characteristics, symptomatology, laboratory abnormalities, treatment measures and clinical outcomes of the community served by our institution, with a sub-analysis of our Hispanic community.

Methods

Study design and participants

This is a single-center, cross-sectional cohort study of patients diagnosed with COVID-19 admitted from 15 March 2020 to 30 April 2020 to MacNeal Hospital, a community-based hospital in Berwyn, Illinois, USA. Inclusion criteria were age >18 years and a positive nasopharyngeal SARS-CoV-2 polymerase chain reaction (PCR). Patients were excluded if they were transferred from an outside institution, had an indeterminate PCR test, or results of diagnostic testing were unavailable at the time of data collection.

Data was collected from the electronic medical record broadly under 4 categories: (i) Pre-clinical data which included demographical data (age, sex, body mass index [BMI], ethnicity/race, primary language), underlying comorbidities, social history, medication history, established relationships with primary care providers; (ii) Clinical data which recorded information on symptomatology and onset, oxygen saturation on presentation, laboratory values of interest such as absolute lymphocyte count, C-reactive protein, D-dimer among others; (iii) Treatment measures which recorded data on antibiotic therapy, use of hydroxychloroquine, tocilizumab and steroids, and maximal oxygen therapy required; (iv) Patient outcomes which included data on intensive care unit (ICU) length of stay (LOS), hospital LOS, 30 day- and 90 day-mortality since admission, need for intubation and mechanical ventilation, development of complications such as acute respiratory distress syndrome (ARDS), shock requiring vasopressors, and acute kidney injury (AKI) requiring new renal replacement therapy. All the data was entered into REDCap software. Approval from the Institutional Review Board (IRB) was obtained prior to beginning of the study.

Statistical analysis

The data were described using proportions for categorical variables. Continuous variables were expressed as median and interquartile range or mean and standard deviation. Normally distributed continuous data was analyzed using T-test. Non-normally distributed continuous data was analyzed using a Mann-Whitney U test. Chi-square and Fisher's exact test was used to analyze categorical data. Data was analyzed using SPSS version 26 software (IBM Corp, USA). A 2-sided p value of less than 0.05 was considered statistically significant.

Multivariable logistic regression was utilized to assess for factors associated with need for intubation and mechanical ventilation. Candidate variables were chosen based on univariate analysis.

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Results

There were 257 patients who met inclusion criteria. The most common reason for exclusion was testing performed at an outside facility (n=5); in addition, two patients were excluded given indeterminate PCR testing. Of the final cohort of 250 patients, 45.2% (n=113) were female. The majority of patients were identified as Hispanic (60.4%, n=151) (Table 1).

Table 1. Baseline characteristics of the entire cohort

Characteristic	Median (IQR) or n (%)
Age, years	60.9 (48.8-71.7)
Female gender	113 (45.2)
Hispanic/Latinx	151 (60.4)
Non-Hispanic White	53 (21.2)
Non-Hispanic Black	31 (12.4)
Asian	2 (0.8)
Other race/ethnicity	12 (4.8)
Body mass index (kg/m^2)	30.32 (26.22-35.46)
Tobacco use disorder	59 (23.6)
Patients with documented primary care providers	149 (59.6)
Prior to admission statin	89 (35.6)
Prior to admission ACE-inhibitor	44 (17.6)
Prior to admission angiotensin receptor blocker	25 (10)
Prior to admission nonsteroidal anti-inflammatory	16 (6.2)
Insulin-dependent diabetes mellitus	30 (12)
Hypertension	134 (53.6)
Chronic kidney disease	14 (5.6)
End-stage renal disease	9 (3.6)
Heart failure	16 (6.4)
Coronary artery disease	28 (10.2)
Chronic lung disease	36 (14.4)
Chronic liver disease	2 (0.8)

The most common presenting symptoms were shortness of breath (69.6%, n=174), cough (69.2%, n=173), and fever (64%, n=160). Hypertension was the most common comorbid condition (53.6%, n=134). A primary care provider was listed at the time of admission in 59.6% (n=149) of cases. The median age at admission of Hispanic patients was significantly lower compared to non-Hispanic patients (56.6 vs. 65.7 years, p<0.01). Non-Caucasian Hispanic patients also had a lower prevalence of hypertension, chronic kidney disease, end-stage renal disease, heart failure, coronary artery disease, and chronic lung disease compared to non-Hispanics (Table 2).

Approximately 89% of patients (n=222) received antibiotics for empiric community acquired pneumonia coverage at the time of admission. Of the included patients, 62% (n=155) received azithromycin. Of the total cohort, 40.4% (n=101) received hydroxychloroquine, 13.2% (n=33) received steroids, and 6% (n=15) received tocilizumab. Renal replacement therapy and vasopressors were required in 4.4% (n=11) and 19.6% (n=49) of cases respectively.

At the time of this analysis, 26% (n=65) of patients required intubation and mechanical ventilation. Of the patients requiring mechanical ventilation, 53.3% (n=32), developed severe ARDS as per the Berlin criteria.[5] The prevalence of tobacco use was significantly higher in patients who required mechanical ventilation when compared to those who did not require mechanical ventilation (40% vs. 18.3%, p<0.01) (Table 3). Patients who required mechanical ventilation were more likely to have coronary artery disease (20% vs 8.1%, p=0.01), a higher median C-reactive protein (CRP) on admission (15.5 mg/dL vs 11.4 mg/dL, p<0.01), higher D-dimer (1.48 mcg/mL vs. 0.87 mcg/mL, p<0.01), higher ferritin (949 ng/mL vs. 774 ng/mL, p<0.01) and a lower oxygen saturation on presentation (86.5% vs. 93%, p<0.01). In the entire cohort, 30-day mortality was 17.1% (n=44); 11.9% in the Hispanic group vs 26.3% in the non-Hispanic group (p<0.003).

A multivariate logistic regression model showed that the strongest factors associated with the need for mechanical ventilation were smoking (OR 2.97, 95%CI 1.01-8.69), CRP >10 mg/dL (OR 4.53, 95%CI 1.49-13.38) and D-dimer >1.5 mcg/mL (OR 3.63, 95%CI 1.31-10.05). Hispanic ethnicity as a sole predictor had a non-significant association with intubation. As expected, oxygen saturation on room air on presentation >90% was a protective factor when predicting intubation (OR 0.11, 95%CI 0.03-0.33) (Table 4).

Table 2. Comparing baseline characteristics between Hispanic patients and non-Hispanic patients

Characteristic	Hispanic (n=151)	Non-Hispanic (n=99)	P value
Age, median (IQR)	56.6 (45.2-68.6)	65.67 (56.1-76.6)	<0.01
Female gender n (%)	70 (46.4)	44 (44.4)	>0.99
Body mass index (kg/m^2), median (IQR)	30.3 (25.9-35.5)	30 (23.9-38.5)	0.71
Insulin-dependent diabetes mellitus, n (%)	14 (9.3)	16 (16.2)	0.10
Hypertension, n (%)	67 (44.3)	68 (68.7)	<0.01
Chronic kidney disease, n (%)	4 (2.6)	10 (10.1)	0.01
End-stage renal disease, n (%)	8 (5.3)	1 (1.0)	0.07
Heart failure, n (%)	4 (2.6)	12 (12.1)	0.03
Coronary artery disease, n (%)	7 (4.6)	21 (21.2)	<0.01
Chronic lung disease, n (%)	14 (9.3)	23(23.2)	<0.01
Chronic liver disease, n (%)	1 (0.66)	1 (1.0)	0.76
Intubated, n (%)	37 (24.5)	28 (28.3)	0.44
Baseline O_2 sat on room air, median (IQR)	91 (87-91)	91 (87-96)	0.73
30-day mortality (%)	18 (11.9)	26 (26.3)	

Table 3. Characteristics comparing patients who required intubation and mechanical ventilation and those who did not

Characteristic	Non intubated (n=185)	Intubated (n=65)	P value
Age, median (IQR)	60.68 (48.5-72.0)	62.63 (50.7-71.4)	0.82
Female gender, n (%)	84 (45.4)	29 (44.6)	>0.99
Hispanic/Latinx, n (%)	114 (61.6)	37 (56.7)	0.55
Non-Hispanic White, n (%)	39 (21.1)	14 (21.5)	>0.99
Non-Hispanic Black, n (%)	21 (11.4)	10 (15.4)	0.39
Asian, n (%)	1 (0.54)	1 (1.5)	0.45
Other race/ethnicity, n (%)	9 (4.9)	3 (4.6)	>0.99
Body mass index (kg/m^2), median (IQR)	30.3 (25.9-35.5)	30.895 (26.7-35.4)	0.81
Smoking, n (%)	34 (18.3)	26 (40%)	<0.01
Insulin-dependent diabetes mellitus, n (%)	20 (10.8)	10 (15.4)	0.38
Hypertension, n (%)	96 (51.9)	38 (58.5)	0.39
Chronic kidney disease, n (%)	11 (5.9)	3 (4.6)	>0.99
End-stage renal disease, n (%)	6 (3.2)	3 (4.6)	0.70
Heart failure, n (%)	13 (7.0)	3 (4.6)	0.77
Coronary artery disease, n (%)	15 (8.1)	13 (20)	0.01
Chronic lung disease, n (%)	27 (14.6)	9 (13.8)	>0.99
Chronic liver disease, n (%)	1 (0.54)	1 (1.5)	0.45
Baseline O_2 sat on room air (%)	93 (89-96)	86.5 (82-89)	<0.01
Abs lymph count, median (IQR)	0.95 (0.7-1.3)	0.8 (0.5-1.1)	0.12
CRP (mg/dL), median (IQR)	11.4 (6-19.5)	15.5 (7.5-23.22)	<0.01
D-dimer (mcg/mL), median (IQR)	0.87 (0.56-2.5)	1.48 (0.69-4.42)	<0.01
Ferritin (ng/mL), median (IQR)	774 (379.75-1465.78)	949 (502.5-1812.8)	<0.01

Table 4. Multivariable logistic regression predicting intubation

Variable	Odds ratio	95% confidence interval
CRP >10 mg/dL	4.52	1.49-13.37
D-dimer >1.5 mcg/mL	5.01	1.59-15.77
Oxygen saturation on presentation >90%	0.11	0.03-0.33
Ferritin >1000 ng/mL	1.39	0.50-3.83
Tobacco use	2.97	1.01-8.69
Coronary artery disease	2.93	0.57-15.07
Hispanic origin	1.04	0.31-3.53

Discussion

Our study described the characteristics of patients that presented to our hospital with SARS-CoV-2 infection. In our patient cohort, the majority of patients identified themselves as being Hispanic/Latinx. Interestingly, admitted non-Caucasian patients were approximately 6 years younger than their Caucasian counterparts ($p<0.001$) and had significantly lower rates of comorbid conditions. When controlling for confounding factors, coronary artery disease and D-dimer level of >1.5 mcg/mL were found to be associated with need for intubation and mechanical ventilation.

The racial/ethnic disparities in COVID-19 have been the subject of recent investigations in the United States and other countries. In England, Public Health England reported that Asian, Black and other minorities had an increased risk of death from COVID-19 when compared with Caucasians. Interestingly enough, similar to our study, Caucasian patients were older and had more chronic comorbidities.[6] Furthermore, in cities like Chicago and New York, rates of SARS-CoV-2 infection were significantly higher in minority racial/ethnic groups when compared to Caucasian residents.[7] In addition, these higher infection rates were accompanied by higher mortality rates in the aforementioned groups; the mortality rates were 93 per 100,000 Caucasian residents, 184 per 100,000 Black residents, and 187 per 100,000 Latino residents in New York City.[6]

The socioeconomic contexts of these groups are likely key players in explaining the differences in infection rates and mortality. In our cohort of patients, despite the fact that Hispanic patients were significantly younger and had lower prevalence of comorbid conditions, rates of intubation and mechanical ventilation were not different when compared to older, and more chronically ill Caucasian patients as one would have expected. It is not uncommon that Hispanic patients live in larger, multi-generational households which increases the probability of viral transmission within a household.[8] In our experience, it was not uncommon for several members of a household to be admitted to the hospital simultaneously.

Social determinants of health have been time and time again associated with health outcomes. Black and Latino patients are more likely to suffer from poverty and its associated lack of healthcare access. These factors, rather than intrinsic genetic differences, are the most likely contributors to the described disparities in the burden of COVID-19 in our cohort. According to the 2018 U.S. Census Bureau, Berwyn, IL has 63% Hispanic residents, and a poverty rate of 13.1%.[9]

There are several limitations to our study. First of all, our hospital serves an area of relatively homogenous socioeconomic status which could hinder the differences in outcomes between Caucasian and non-Caucasian patients. In addition, given the rapid evolution of the pandemic and its associated management and treatment modalities, there is a potential for different outcomes based on changes in practice. Nonetheless, we do not anticipate that such changes would drastically change the conclusions of our study.

Conclusions

In conclusion, our review of consecutive patients with COVID-19 infection showed that

the majority of the admitted patients were of Hispanic ethnic groups. Despite being younger and healthier, the need for mechanical ventilation was not different when compared to non-Hispanic patients. However, the Hispanic group had a lower mortality rate. Despite a non-significant association between race and worse outcomes, larger studies are needed to fully elucidate the effects of social determinants of health and healthcare disparities in patients with COVID-19.

Author contributions statement: DCH conceptualized the study design, developed the IRB protocol, collected and analyzed data, and drafted the manuscript. MJ, NT, CJ, AC, FGG, DCA, MJZR, JLZG, GMR, DEB, and RR collected data. CJ contributed in the study design. FA supervised the drafting of the IRB protocol and drafted the manuscript. All authors read and approved the final version of the manuscript.

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